भारतीय मानक
Indian Standard

IS 1177 : 2022

वेटिवर का तेल (खेती और खस) — विशिष्टि

(तीसरा पुनरीक्षण)

Oil of Vetiver (Cultivated and *Khus*) — Specifications

(Third Revision)

ICS 71.100.60

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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Fragrance and Flavour Sectional Committee had been approved by the Petroleum, Coal and Related Product Division Council.

Khus plant, *Vetiveria zizanioides* (Linn), Nash, syn. *Chrysopogon zizanioides* (L.) Roberty belongs with family Gramineae occurs wild in several parts of India. Roots of vetiver are the source of world famous “Khus Oil” which has considerable value in essential oil industry. Two distinct morphological complexes of vetiver are found to inhabit spatially separated geographic regions in India: one in the north along the Indo-gangetic plains and adjoining areas mainly in the states of Rajasthan, Madhya Pradesh, Uttar Pradesh and Bihar, and the other in the south along with east and west coasts of Indian peninsula in the states of Andhra Pradesh, Karnataka, Tamilnadu and Kerala. The two races are distinctly different. The north Indian wild type represented by “Bharatpur Type” producing superior quality laevorotatory root oil and the south Indian “cultivated type” producing dextrorotatory root oil. To avoid possible confusion between the oil produced from wild vetiver or *Khus* and the oil produced from cultivated vetiver, the former is called Oil of Vetiver (*Khus)* while the latter is called Oil of Vetiver (Cultivated).

This Indian Standard was first published in 1957 and subsequently revised in 1969 and 1996. Two Indian Standards on vetiver oil namely IS 1177 : 1957 'Vetiver (*Khus)* oil' and IS 1614 : 1960 'Oil of vetiver roots (cultivated)' were amalgamated in 1969 as both the products were obtained from taxonomically same plant source known as *Vetiveria zizanioides* (Linn), Nash, syn. *Chrysopogon zizanioides* (L.) Roberty. Since 1969, the production of both these oils had reduced resulting in a change of the physico-chemical characteristics. This standard was reviewed to incorporate the characteristics of the oils presently in vogue. During the third revision, the requirements of refractive index, relative density, refractive index, etc have been modified. Besides, identification of marker constituents, a new requirement of free alcohol was introduced. Also, the chromatographic profile for both the varieties of Vetiver have been added, and also the representative chromatograms for both the varieties have been incorporated during the third revision.

Clause **5.1.3** includes purchaser and seller agreement.

The composition of the Committee, responsible for the formulation of this standard is given at Annex C.

For the purpose of deciding whether a particular requirement of this standard is compiled with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

OIL OF VETIVER (CULTIVATED AND KHUS) — SPECIFICATION

(Third Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and tests for oil of vetiver (cultivated and *Khus).* The essential oil is used by the soap, perfumery and cosmetics industries. It is also used as a flavoring agent.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard definitions given in IS 6597 : 1988 shall apply

4 TYPES

There shall be two types of the essential oils with the following details:

4.1 Type 1 — Oil of vetiver (Cultivated), and

4.2 Type 2 Oil of vetiver (*KHUS*)

5 REQUIREMENTS

5.1 Description

5.1.1 Oil of vetiver (cultivated and *Khus*) is obtained by steam or hydro-distillation of clean and fresh or air-dry roots of cultivated plant or roots of vetiver growing wild. Both the plant materials belong to the plant source *Vetiveria zizanioides* (Linn.), Nash, syn. *Chrysopogon zizanioides* (L.) Roverty family Gramineae.

5.1.2 The oil shall be a clear liquid, free from sediment, suspended matter, separated water and adulterants in the form of high boiler liquids, etc. The oil shall be examined for its clarity, separated water and sediment as prescribed in IS 326 (Part 2).

5.1.3 The assessment of odour and appearance shall be subject to agreement between the purchaser and seller. The oil shall be tested olfactorily, especially for by-odours/by-notes, and for the presence of adulterants and impurities, if any, as per IS 2284.

5.2 The oil shall also comply with the requirements given in Table 1.

6 SAMPLING

6.1 Representative samples (each sample containing not less than 50 ml) of the test material shall be drawn from the lots as prescribed under IS 326 (Part l) : 1984.

6.2 Number of Tests

Test for the determination of all the characteristics shall be conducted on the composite sample as prescribed in **5.2** and Table 1.

6.3 Criteria for Conformity

The lot shall be considered as conforming to the specification if the composite sample satisfies all the requirements specified in Table 1.

7 PACKING AND MARKING

7.1 Packing

The material shall be supplied in well closed containers permitting a minimum of air space, as agreed to between the purchaser and supplier. The containers shall be well protected from light and stored in a cool and dry place.

7.2 Marking

Each container so filled shall be clearly marked with the following information:

a) Name of the material;
b) Name of manufacturer and his recognized trade mark, if any;
c) Year of manufacture;
d) Net and gross mass of the material;

e) Place of origin of the material;
f) Volume of the material in the package; and
g) Batch no.

7.3 BIS Certification Marking

The containers may also be marked with the Standard Mark.

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

8 TEST METHODS

8.1 Tests shall be conducted as prescribed in Clause **5.2** and the appropriate references specified in col 5 of Table 1.

Table 1 Physico-Chemical Characteristics of Oil of Vetiver

(*Clause* 5.2)

SI No. (1)	Characteristics (2)	Oil of Vetiver *(Cultivated)* (3)	Oil of Vetiver *(KHUS)* (4)	Ref to the Test Method (5)
i)	Appearance and colour	Brown to reddish brown viscous liquid	Brown to reddish brown sometimes greenish viscous liquid	
ii)	Odour	Characteristic and persistent woody aroma	Characteristic and persistent woody, balsamic aroma	IS 2284 : 1988
iii)	Relative density at 27 °C	0.985 to 1 .020	0.985 to 1.010	IS 326 (Part 3) : 2006
iv)	Refractive index at 27 °C	1.514 to 1.530	1.512 to 1.528	IS 326 (Part 5) : 2006
v)	Optical rotation, $[\alpha]_D^{20}$	(+) 30.1 ° to (+) 33.8°	(-) 62.7° to (-) 69.0°	IS 326 (Part 4) : 2005
vi)	Acid value, *Max*	35	30	IS 326 (Part 7) : 2006
vii)	Ester value	5 to 16	8 to 25	IS 326 (Part 8) : 2005
viii)	Ester value after acetylation	110 to 165	124 to 195	IS 326 (Part 9) : 1980
ix)	Free alcohols. percent, *Min*	30	45	IS 326 (Part 9/ Sec 1) : 2017
x)	Combined alcohols, percent	8 to 25	3 to 10	IS 326 (Part 9/ Sec 1) : 2017
xi)	Total alcohol (as Khusinol; Molecular weight 220 g/mol), percent by mass, *Min*	46	52	IS 326 (Part 9/ Sec 1) : 2017
xii)	Carbonyl value (as vetivone; Molecular weight 218 g/mol)	23 to 68 (9 to 26.5 percent)	16 to 62 (6 to 24 percent)	IS 326 (Part 10) : 2005
xiii)	Miscibility in 80 percent *(v/v)* ethanol (volumes)	1 to 2 volumes; slight opalescence may appear sometimes	1 to 2 volumes; clear	IS 326 (Part 6) : 2005

9 Quality of Reagents

Unless specified otherwise pure chemicals, solvents and distilled water (*see* IS 1070 : 1992) shall be used.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Clause* 2)

IS No.	*Title*
IS 326	Methods of sampling and test for natural and synthetic perfumery materials:
(Part 1) : 1984	Sampling *(Third revision*)
(Part 2) : 1980	Preliminary examination of perfumery materials and samples *(second revision*)
(Part 3) : 2006/ ISO 279 : 1998	Relative density *(Third revision*)
(Part 4) : 2005/ ISO 592 : 1998	Determination of optical rotation (*Third revision*)
(Part 5) : 2006/ ISO 280 : 1998	Determination of refractive index (*Third revision*)
(Part 6) : 2005/ ISO 875 : 1999	Evaluation of miscibility in ethanol (*Third Revision)*
(Part 7) : 2006/ ISO 1242 : 1999	Determination of acid value (*Third revision*)
(Part 8) : 2005/ ISO 709 : 2001	Determination of ester value (*Third revision)*
(Part 9/ Sec 1) : 2017/ ISO 1241 : 1996	Determination of ester value after acetylation and free alcohols (*Third Revision*)
(Part 11/ Sec 1) : 2017/ ISO 1271 : 1983	Determination of carbonyl value Section 1 Free hydroxylamine method *(Third revision*)
IS 1070 : 1992	Water for general laboratory use (*third revision*)
IS 2284 : 1988	Methods for olfactory assessment of natural and synthetic perfumery materials *(first revision*)
IS 6597 : 1988	Glossary of terms relating to fragrance and flavour industry (*Second Revision*)

ANNEX B

(Foreword)

CAPILLARY GAS CHROMATOGRAPHIC ANALYSIS OF OIL OF VETIVER

B-1 GENERAL

B-1.1 The chromatographic conditions given here are for guidance only.

B-1.2 Outline of the Method

A essential oil sample is dissolved in a suitable solvent (for example, acetone, cyclohexane, *n*-hexane) and is injected into the heated injector (split/splitless) of a gas chromatograph coupled with fused silica capillary column coated with 5% diphenyl and 95%dimethylpolysiloxane as stationary phase. The sample vapours travels along with the carrier gas or mobile phase by the mechanism of adsorption and desorption phenomena from one end of the capillary column to the other end connected with detector (Flame Ionization Detector). During their travel through carrier gas, the constituents of the sample undergo distribution depending upon their chemical affinity at different rates and ultimately get separate from one another. The separated constituents emerge from the detector end of the column one after another and are detected by suitable means whose response is related to the amount of a specific component leaving the capillary column. The amplified detector signals are recorded and stored in a computer controlled software programme. Furthermore, the area corresponds to each baseline separated peak is reported as the area percent of each constituents present in the oil sample.

B-2 APPARATUS

B 2.1 Any suitable capillary gas chromatograph and column (non polar) capable of being operated under conditions suitable for resolving the individual constituents into distinct peaks may be used. The typical chromatograms for oils of vetiver (cultivated and KHUS*)* with the following chromatographic conditions are shown in Fig. 1 and 2.

Table 2 Column Operating Conditions

Sample size	0.1 µl (diluted in hexane/ DCM)
Capillary column:	5% diphenyl in polydimethyl siloxane
Material	polydimethyl siloxane
Length	30 m
Internal diameter	0.25 mm
Film thickness	0.25 µm
Carrier gas	Hydrogen (1 ml/min)
Flow split ratio	1: 40
Injector Type	split/splitless
Injection temperature	280 °C
Detector:	
Type	Flame ionization detector
Temperature	280 °C
Oven Temperature Programming:	
Temperature 1	60 °C
Ramp 1	3°C/min
Temperature 2	240 °C isothermal for 2 min.
Ramp2	5 °C/min
Temperature 3	280 °C

B-2.2 Syringe type

A 0.5 µL to 1.0 µL volume syringe shall be used for manual injection of essential oils obtained from both the types of vetiver. For analysis where an autosampler is used for sample injection, an equivalent and autosampler compatible syringe shall be used for sample injection. Syringe cleaning with non-polar solvents like *n*-hexane is recommend before and after the sample injection.

Chromatographic Profile

Sl No.	*Component*[1]	*Oil of Vetiver (Cultivated), Percent*[2]		*Oil of Vetiver (KHUS), Percent*[2]	
		Min	*Max*	*Min*	*Max*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Khusimone	1.5	2.6	ND	ND
ii)	Khusinol	ND	ND	50.0	58.0
iii)	Khusian-2-ol	1.2	2.5	ND	ND
iv)	Vetiselinenol	1.5	2.8	0.5	1.0
v)	Oplopanone	0.3	1.0	1.0	1.4
vi)	Isonootkatol	0.3	1.8	3.0	4.2
vii)	Khusimol	26.0	33.9	ND	ND
viii)	*(E)*-Isovalencenol	5.5	9.5	2.0	6.0
ix)	β-vetivone	2.5	4.3	0.4	1.1
x)	α-vetivone	2.1	2.9	0.5	2.0

NOTE — The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.

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[1] Components are listed according to their elution order on a non-polar column (*see* Fig. 1 and 2).

[2] Area, percent: Values based on non-polar column data (*see* Fig. 1 and 2). ND: not detected.

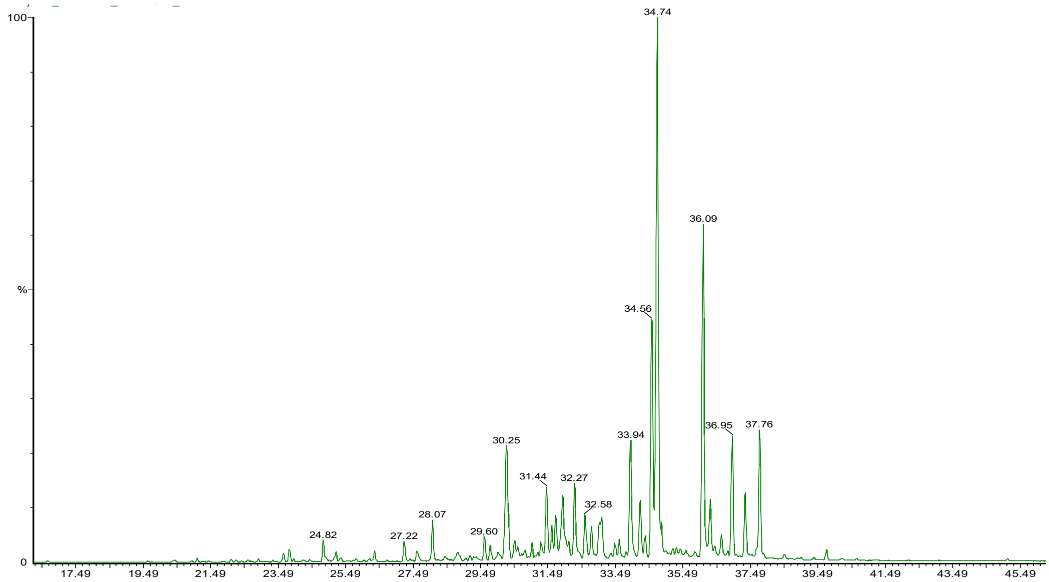

FIG. 1 TYPICAL CHROMATOGRAM OF OIL OF VETIVER (CULTIVATED)

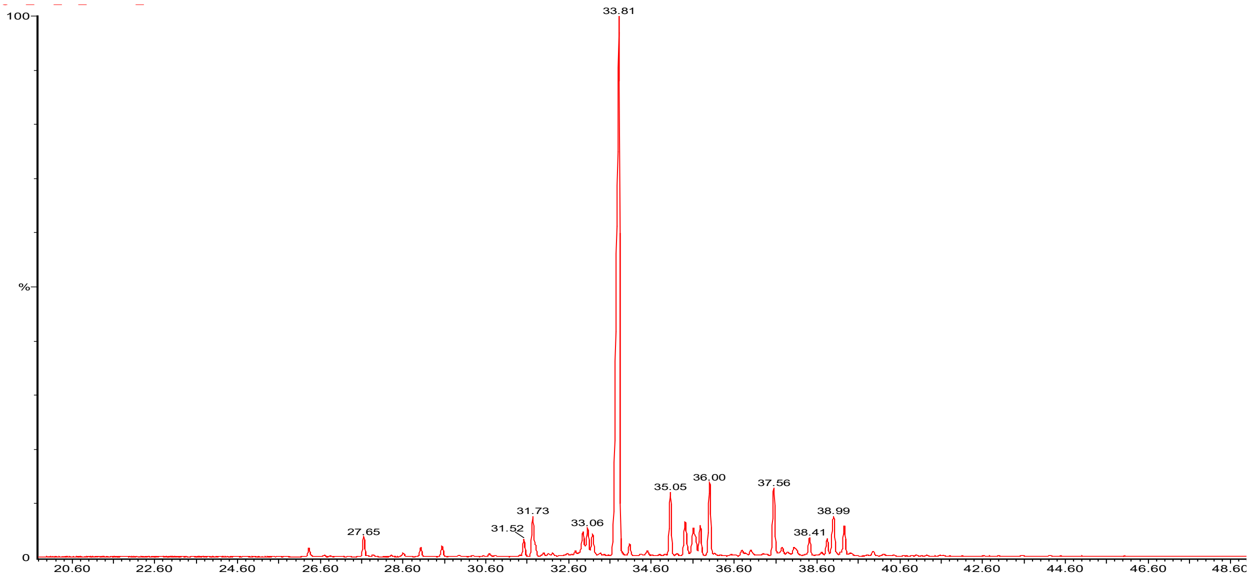

FIG. 2 TYPICAL CHROMATOGRAM OF OIL OF VETIVER (KHUS)

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Fragrance and Flavour Sectional Committee, PCD 18

Organization	*Representative(s)*
CSIR-Central Institute of Medical and Aromatic Plants, Lucknow	DR PRABODH K. TRIVEDI (***Chairperson***)
All India Agarbathi Manufacturers Association, Bengaluru	SHRI SARATH BABU P.S
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